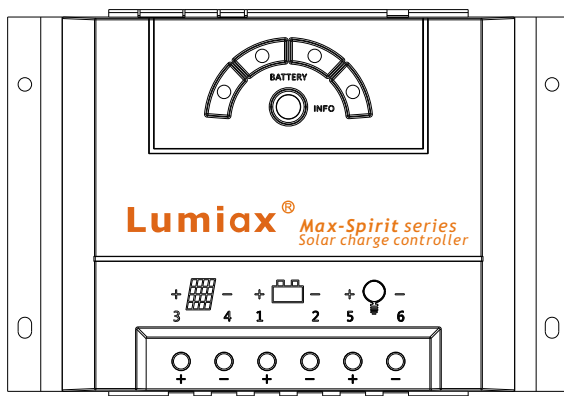


# Max<sup>TM</sup>-Spirit series

## Solar charge controller

### 10/20/30/40A



## User Manual

## Solar charge controller

Dear Clients,

Thanks for selecting the Max-Spirit series solar controller. Please take the time to read this user manual, this will help you to make full use of many advantages the controller can provide your solar system.

This manual gives important recommendations for installing and using and so on. Read it carefully in your own interest please.

### 1.Description of Function

Max-Spirit series solar controller is specifically designed to meet the needs of solar home systems. It provides the best cost-effective.

It comes with a number of outstanding features, such as:

- 12V/24V automatic recognition
- Clear readable display of charge/discharge and error description
- Temperature compensation
- Perfect EMC design
- Many choices of battery type, working mode and protection
- Four stage PWM charge way: fast, boost, equalization, float
- Full automatic electronic protect function

#### ■ Optional

USB port/ External temperature sensor/ External LED display

### 2.Safety instructions and waiver of liability

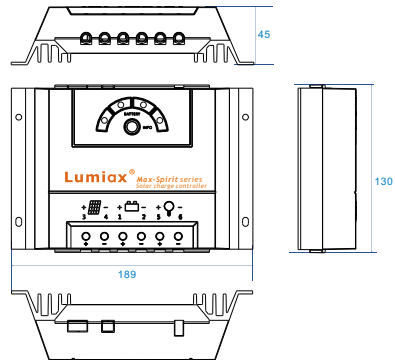
#### 2.1 Safety

- ①The solar charge controller may only be used in PV systems in accordance with this user manual and the specifications of other modules manufacturers. No energy source other than a solar generator may be connected to the solar charge controller.
- ②Batteries store a large amount of energy, never short circuit a battery under all circumstances. We strongly recommend connecting a fuse directly to the battery to protect any short circuit at the battery wiring.
- ③Batteries can produce flammable gases. Avoid making sparks, using fire or any naked flame. Make sure that the battery room is ventilated.
- ④Avoid touching or short circuiting wires or terminals. Be aware that the voltages on special terminals or wires can be as much as twice the battery voltage. Use isolated tools, stand on dry ground, and keep your hands dry.
- ⑤Keep children away from batteries and the charge controller.

#### 2.2 Liability Exclusion

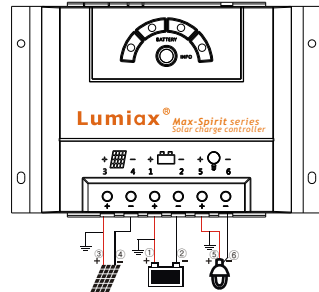
The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by any unauthorized person, unusual use, wrong installation, or bad system design.

### 3.Dimensions




### 4.Installation

The following diagrams provide an overview of the connections and the proper order.



- To avoid any voltage on the wires, first connect the wire to the controller, then to the battery, panel or load.
- Make sure the wire length between battery and controller is as short as possible.
- Recommended minimum wire size:  
10A : 4mm<sup>2</sup>; 20A : 10.0mm<sup>2</sup>; 30/40A : 16.0mm<sup>2</sup>.
- Be aware that the positive terminals of Max-Spirit are connected together and therefore have the same electrical potential. If any grounding is required, always do this on the positive wires.
- Connecting capacitive load may trigger short circuit protection.

 **Remark: If the device is used in a vehicle which has the battery negative on the chassis, loads connected to the controller must not have an electric connection to the car body, otherwise the Low Voltage disconnect and electronic fuse functions of the controller are short circuited.**

# Solar Charge Controller Max-Spirit User Manual

## 4.1 Mounting location requirements

Do not mount the solar charge controller outdoors or in wet rooms. Do not subject the solar charge controller to direct sunshine or other sources of heat. Protect the solar charge controller from dirt and moisture. Mount upright on the wall on a non-flammable substrate. Maintain a minimum clearance of 10cm below and around the device to ensure unhindered air circulation. Mount the solar charge controller as close as possible to the batteries.

## 4.2 Fastening the solar charge controller

Mark the position of the solar charge controller fastening holes on the wall, drill 4 holes and insert dowels, fasten the solar charge controller to the wall with the cable openings facing downwards.

## 4.3 Connection

We strongly recommend connecting a fuse directly to the battery to protect any short circuit at the battery wiring. Solar PV modules create current whenever light strikes them. The current created varies with the light intensity, but even in the case of low levels of light, full voltage is given by the modules. So, protect the solar modules from incident light during installation. Never touch uninsulated cable ends, use only insulated tools, and make sure that the wire diameter is in accordance with the solar charge controller's expected currents. Connections must always be made in the sequence described below.

### 1st step: Connect the battery

Connect the battery connection cable with the correct polarity to the middle pair of terminals on the solar charge controller (with the battery symbol). If the system is 12V, please make sure that the battery voltage is within 10V~16V; else if the system is 24V, the battery voltage should be between 20V~30V. If the polarity is correct, the LED on the controller will begin to show.

### 2nd step: Connect the solar module

Ensure that the solar module is protected from incident light. Ensure that the solar module does not exceed the maximum permissible input current. Connect the solar module connection cable to the correct pole of the left pair of terminals on the solar charge controller (with the solar module symbol).

### 3rd step: Connect loads

Connect the load cable to the correct pole of the right pair of terminals on the solar charge controller (with the lamp symbol). To avoid any voltage on the wires, first connect the wire to the load, then to the controller.

### 4th step: Final work

Fasten all cables with strain relief in the direct vicinity of the solar charge controller (clearance of approx.10cm).

## 5.Starting up the controller

### 5.1Self Test

As soon as the controller is supplied with battery, it starts a self test routine. Then the display changes to normal operation.

### 5.2System Voltage

The controller adjusts itself automatically to 12V or 24V system voltage. As soon as the battery voltage at the time of start-up is within 10V to 16V, the controller implies a 12V system, else if the battery voltage is within 20V to 30V, the controller implies a 24V system.

If the battery voltage is not within the normal operating range (ca.10 to 16V or ca.20 to 30V) at start-up, a status display according to the section 7.2 Charge & Error display.

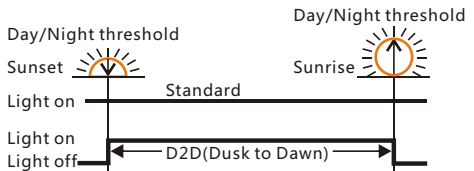
### 5.3Battery Type

The Max-Spirit series controller applies to Liquid and Gel battery, the factory default setting is suitable for liquid battery. Please refer to 6.1.2 change setting.

### 5.4 Work Mode

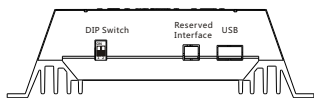
The work mode of the controller is selectable (Standard and D2D), the factory default setting is standard.

Please refer to 6.1.1 change setting.



# Solar Charge Controller Max-Spirit User Manual

## 6. Interface Description



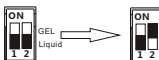
### 6.1 DIP Switch



6.1.1 DIP switch stall 1 -- Work mode (Standard and D2D) settings, the default is Standard (As shown in figure). If slide the DIP switch to "ON", the controller works in D2D mode.



6.1.2 DIP switch stall 2 -- Battery type selection, the default setting is liquid battery (As shown in figure). If slide the DIP switch to "ON", the battery type is selected as GEL.



### 6.2 Reserved Interface

External temperature sensor and an external LED display , please consult the supplier.

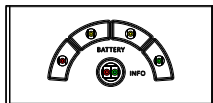
### 6.3 USB Interface

Some models have a USB interface, provides an output voltage 5V 800mA of current, for charging mobile phones and other smart devices.

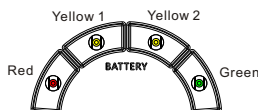
## 7. Display Functions

The controller is equipped with 6 LEDs.

In normal operation, the controller shows charge or discharge status, battery capacity and load status.



### 7.1 Battery Capacity display :



Red On, Energy of Battery <25%.

Yellow 1 On, Energy of Battery is about 25~50%.

Yellow 2 On, Energy of Battery is about 50~75%.

Green On, Energy of Battery is about 75~100%.

The percentage corresponds to the available energy until low voltage disconnect in relation to a fully charged battery.

### 7.2 Charge & Error display ( INFO ) :

Red INFO Green flash, is charging, else if INFO Green is on, the controller is in discharge state ; INFO Red On, is Error Status. For more details, please see table below.

Error	Display	Reason	Remedy
Loads are not supplied	Red LED is on	Battery is low	Load will reconnect as soon as battery is recharged
	Red LED is flashing	Fast flash: over current/short circuit of loads Slow flash: over temperature protection	Switch off all loads. Remove short circuit. Auto recovery when the temperature is below 70°C.
Battery is empty after a short time	Red LED is on	Battery has low capacity	Change battery
Battery is not being charged during the day	Green LED is on	Solar array faulty or wrong polarity	Remove faulty connection/ reverse polarity
Over voltage protection	Red(Info) and Green(Bat) LED are lighted	Battery voltage too high (> 15.5V/31V)	Check if other sources overcharge the battery. If not, controller is damaged.
		Battery wires or battery fuse damaged, battery has high resistance	Check battery wires, fuse and battery.
Does not recognize the system voltage	All LED Lighted	The battery voltage is not within the normal operating range at start-up	Charge or discharge the battery to make the voltage within the normal range

## 8. Safety Features

	Solar terminal	Battery terminal	Load terminal
Reverse polarity	Protected *1	Protected *1	Protected *2
Short circuit	Protected	Protected *3	Switches off immediately
Over current	—	—	Switches off with delay
Reverse Current	Protected	—	—
Over voltage	Max.55V *4	Max. 40V	—
Under voltage	—	—	Switches off
Over temp.	switches off the load if the temperature reaches the set value.		

\*1 Controller can not protect itself in a 24V system when polarity of battery or solar is reversed.

\*2 Controller can protect itself, but loads might be damaged.

\*3 Battery must be protected by fuse, or battery will be permanently damaged.

\*4 The solar panel voltage should not exceed this limit for a long time as voltage protection is done by a varistor.

**Warning: The combination of different error conditions may cause damage to the controller. Always remove the error before you continue connecting the controller.**

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## 9. Technical Data

Technical Data	Max 10 - S	Max 20 - S	Max 30 - S	Max 40 - S
	Max 10 - S U	Max 20 - S U	Max 30 - S U	Max 40 - S U
System voltage	12V/24V automatic recognition			
Max solar current or load current	10 A	20 A	30 A	40 A
Float voltage	13.7V/27.4V (25°C)			
Fast voltage	14.0V/28.0V (25°C)			
Boost voltage	14.5V/29.0V (25°C)			
Equal voltage	14.8V/29.6V (25°C)			
Day/Night threshold	5.0V/10.0V			
Load disconnect voltage	11.2~11.8V/22.4~23.6V			
Load reconnect voltage	12.5V/25.0V			
Battery type	Liquid, Gel			
Work mode	Standard, D2D(Dusk to Dawn)			
Temperature compensation	-4.17 mV/K per cell (Boost and Equal charge), -3.33 mV/K per cell (Float charge)			
Max solar voltage	55 V			
Max battery voltage	40 V			
Dimensions/Weight	130*189*47mm / 500g			
Max wire size	25mm <sup>2</sup>			
Max power consumption	10mA			
Temp. Range during operation	-40°C ~ +60 °C			
Storage temperature	-40°C ~ +80 °C			
Relative humidity	10%~90% Non-condensation			
Case protection	IP22			
USB port	5.0V 800mA(only suit for Max-SU series products)			